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Brief introduction on the special section of Biomechanics and Biomaterials

Biomechanics and biomaterials are research fields with long history and have unique features of both old and new. People have used the biomaterials since the beginning of human civilization, such as bamboo and wood for the construction several thousands years ago. And people have treated diseases by using the approaches of biomechanics even much earlier than using biomaterials — the mechanical force is proved to play important roles in traditional Chinese cupping treatment, and acupuncture and moxibustion treatment.

In this special issue the readers can find some interesting examples of recent advances in the fields of Biomechanics and Biomaterials. For instance, bamboo is a favorable sustainable material for the construction industry because of its attractive combination of strength-to-weight ratios and stiffness-to-weight ratios. Despite of the complexity of the microstructures, people now can incorporate the information of the hierarchical and multi-scale structure of bamboo and the distribution of microscale fibers into a finite element model to analyze the mechanical behavior of bamboo [1]. Pain sensation may appear when skin is under extreme mechanical and thermal stimulations. In order to understand the pain sensation in traditional Chinese cupping treatment, the effect of viscoelasticity of skin on pain sensation was analyzed using the pain sensation model [2]. Blood cell aggregation and adhesion to endothelial cells under shear flow are crucial to many biological processes, in which the cellular interactions are mainly mediated by the dynamics of receptor–ligand binding. A multiscale model that couples cellular aggregation dynamics and adhesion kinetics was developed for understanding these complex biological processes [3]. And it is found that there is direct correlation between the mechanical properties of red blood cells and their pathological conditions, such as malaria infection. These finding may provide promising tools for the early diagnosis of diseases [4]. The mechanical responses of the interface between lipid bilayer and graphene under different types of loads by molecular dynamics simulation provide a basis for the design of biomedical devices and nanotherapeutics [5,6].

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